

MYOLOGY

OF THE

PIGEON.

BURK.

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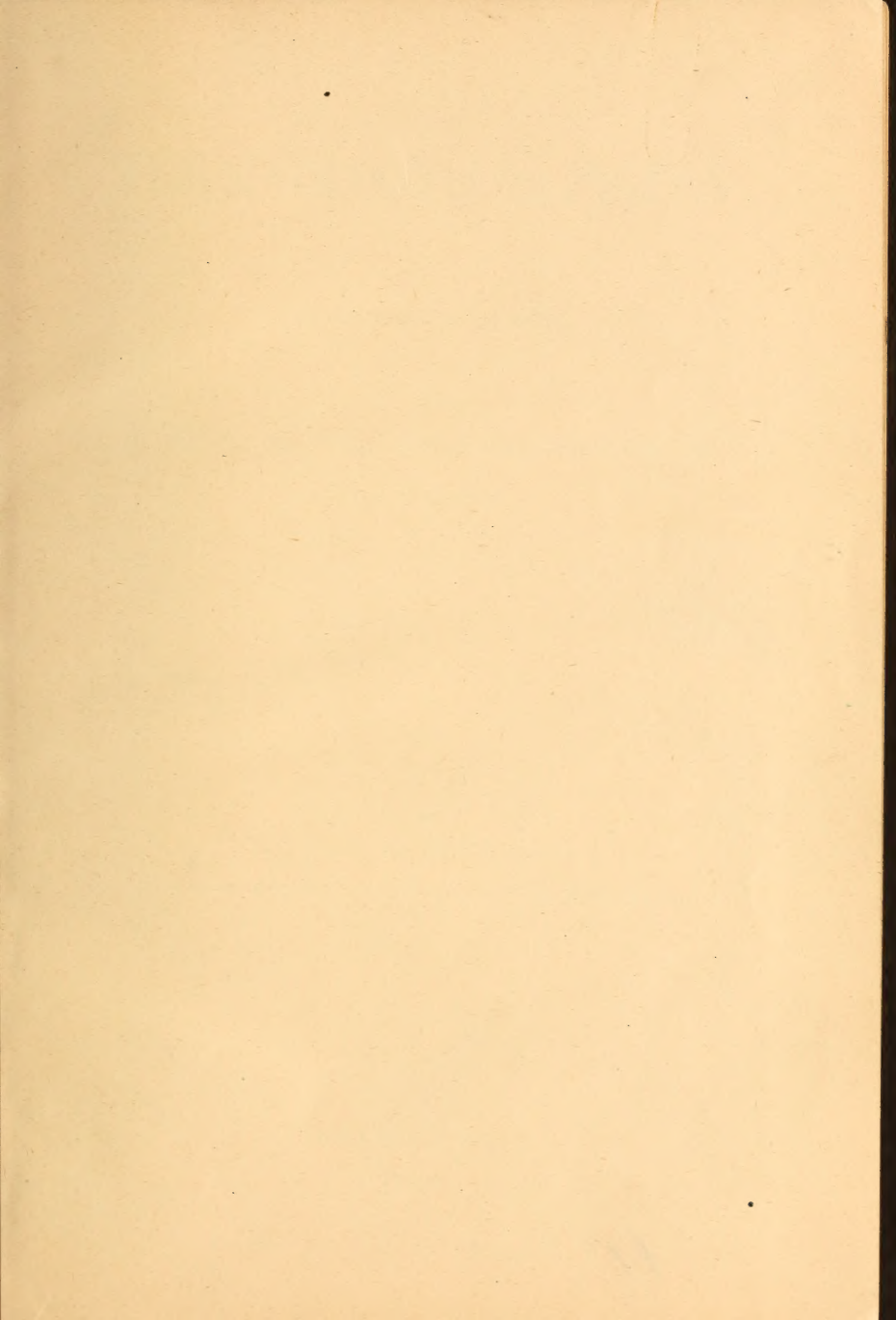
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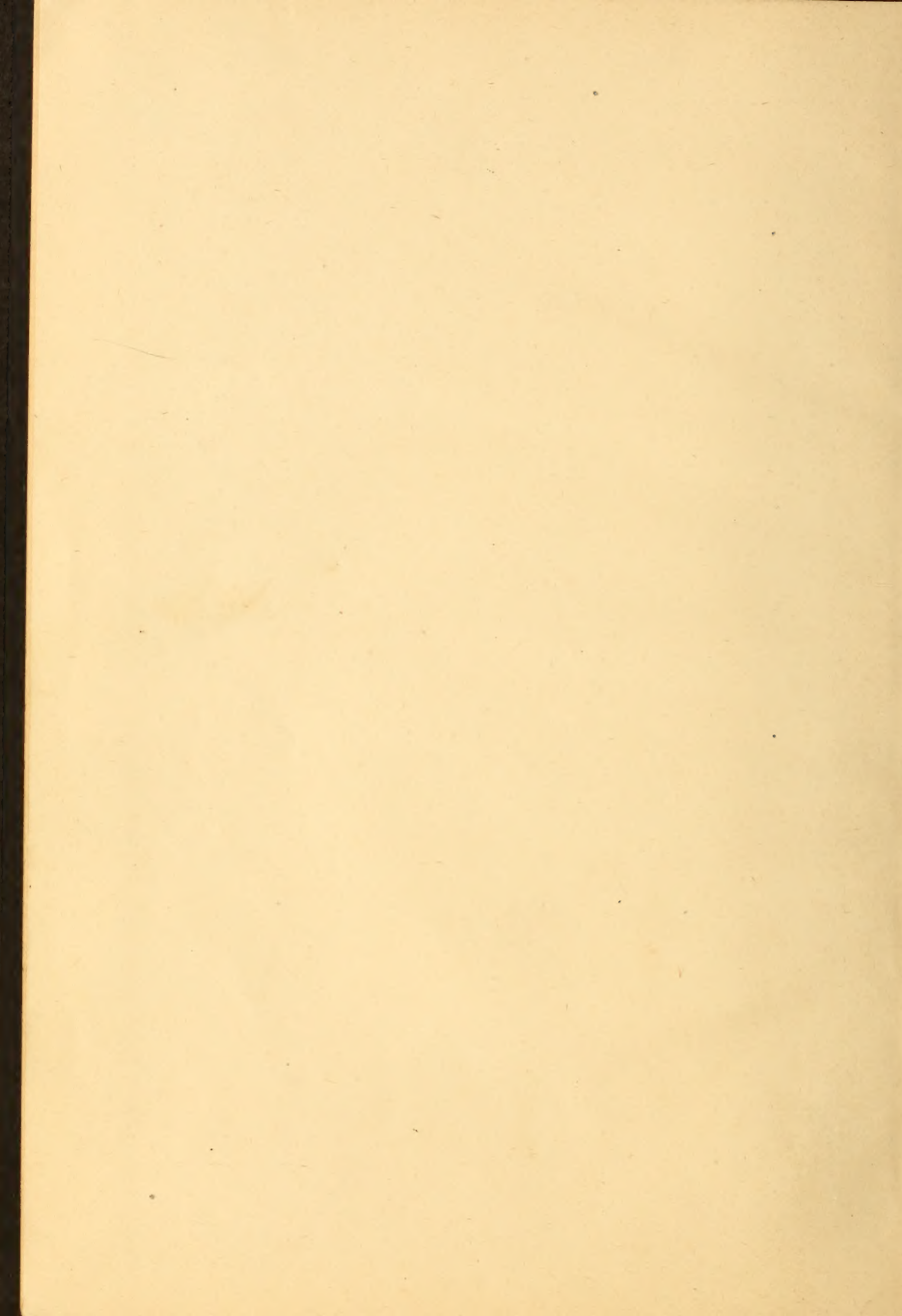
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THE MYOLOGY of the PIGEON

(COLUMBA LIVIA)

A STUDY OF THE MUSCULAR SYSTEM OF THE PIGEON

BY

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CHARLES M. BURK, M.D.

INSTRUCTOR IN ZOOLOGY IN THE UNIVERSITY OF PENNSYLVANIA

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INTRODUCTION.

That the pigeon has a well-developed muscular system is shown by its rapid and sustained flight. These birds have been killed in New York whose crops contained undigested grains of rice that must have been swallowed in North Carolina or Georgia not long before. We are also familiar with their use as carriers of messages, in which their speed has been carefully and accurately timed and found to be truly remarkable. These and other instances of rapid flight and long endurance are accounted for when we come to inspect the muscles of flight and observe how well adapted they are by structure and development for that purpose. The pigeon, therefore, makes a very good subject for laboratory work when it is desired to dissect a representative of the order *Avis*. e/

In this sketch of the myology of the pigeon, the muscles are grouped in the following manner. Beginning with the muscles of the head, those which perform the movements of the mandible, ear and eye are described. In the next group the

muscles of the neck are dissected. In successive order the following groups are described. Those of the pectoral extremity, of the shoulder girdle and arm, of the hand, of the thorax and abdomen, of the trunk and thigh, of the front of the leg, of the back of the leg, and lastly the muscles of the tail.

Under the heading of each group a list of the muscles found in the group is given. It is hoped that this orderly discussion will assist the student not only in the work of dissection, but also in the more important end of acquiring a clear idea of the relative position of the several parts which go to make up the muscular system.

Before the student begins the study of the myology of the pigeon he should be thoroughly familiar with its osteology, an outline of which will be found in Dr. T. J. Parker's *Zootomy* (vertebrata).

Myology of the Pigeon.

MUSCLES OF THE HEAD.

In this group will be found the muscles which have to do with the movement of the lower jaw, eye, ear, and tongue. In removing the skin of the head, the first muscle which makes its appearance is the *Platysma Myoides*, which closely adheres to the skin. After the removal of this, the muscles of the lower jaw are most prominent. These consist of the

Masseter.

Temporal.

Digastric.

Ento-tympanic.

Pterygoides internus.

Pterygoides externus.

PLATISMA MYOIDES is a thin sheet of muscle found immediately beneath the skin. It covers the posterior and lateral portions of the head and has its origin in either side of the head, arising from that portion of the frontal bone which forms the

posterior boundary of the orbital cavity, and also from the squamous portion of the temporal. From this origin, the fibres on either side pass backward and inward and meet at the point where the head joins the neck. The continuation of the muscle passes backward, covering the back and sides of the neck, and adhering closely to the skin into which it finally inserts. The fibres of the muscle, near its origin, are also attached to the skin of the external ear.

MASSETER.—This is a small muscle situated just in front of the orifice of the ear. It arises from the outer surface of the squamosal bone and passes obliquely downward and forward, and as it approaches the jugal bone it gives off a delicate tendon which passes over the outside of the jugal to insert into the articular portion of the mandible. The main portion of the muscle then passes on the internal side of the jugal to insert into the supra-angular portion of the mandible. The function of this muscle is to raise the lower jaw.

TEMPORAL. This muscle is only exposed by carefully removing the entire eyeball. It arises by two sets of muscular fibres. The first portion arises from the base of the alisphenoid. The second portion arises from the upper surface of the paletine

and pterygoid bones. Both portions form a common insertion into the internal surface of the supra-angular portion of the mandible. The function of this muscle is to close the lower jaw and to hold it firmly to its articulation.

DIGASTRIC.—This muscle has two distinct portions. The first portion arises from the exoccipital region of the skull, and passes obliquely downward and forward to insert into the posterior surface of the articular bone of the mandible. The second portion is entirely covered by the first portion, and arises from the tympanic portion of the squamosal; from thence it passes directly to the articular bone of the mandible. It is the first portion of this muscle that is illustrated in Fig. 1.

ENTO-TYMPANIC is a small muscle situated at the base of the skull, the function of which is to raise the pterygoid region. It arises from the rostrum and basi-sphenoid and passes backward to be inserted into the pterygoid and quadrate of the same side.

PTERYGOIDES INTERNUS is a large muscle situated at the base of the cranium, arising from the palatine, sphenoidal rostrum, and pterygoid, and inserting into the inner surface of the ramus of the mandible as far back as the articular bone.

PTERYGOIDES EXTERNUS.—This is smaller than, and concealed by, the preceding. It arises from the quadrate and pterygoid bones. It runs forward and outward to be inserted on the inner surface of the mandibular ramus.

MUSCLES OF THE TONGUE.

These consist of certain muscles which are attached to the hyoid apparatus, and perform the different movements of the tongue. They consist of the

Mylo-hyoid,
Stylo-hyoid,
Genio hyoglossus,
Cerato-hyal,
Depressor-glossi.

MYLO-HYOID is a very delicate set of muscle fibres arising on either side from the anterior half of the lower margin of the jaw. The fibres from either side run transversely across to join in a median raphe. This muscle really forms the floor of the mouth, and supports the lingual and hyoid apparatus.

STYLO-HYOID.—This is a delicate slip of muscle which is seen lying on the outer side of the face. It arises from the external surface of the articular bone of the mandible, and passes to be inserted into the cerato-branchial of the thyro-hyal. When this muscle contracts it pulls the tongue to one side.

GENIO-HYOGLOSSUS.—This is the largest of this group. It arises from the internal surface of the mandible at about the middle. The fibres form a flat band of muscle which passes obliquely downward and backward until it reaches the thyro-hyal, around which it courses and which it envelopes back to its posterior extremity. The function of this muscle is to thrust the tongue from the mouth.

CERATO-HYAL is a slender muscle covering the thyro-hyal, along which it passes, following the course of the thyro-hyal and adhering to the hyoid until it reaches the uro-hyal, into which it is inserted. This muscle has also the function of moving the tongue to one side.

DEPRESSOR-GLOSSI is an azigos or single muscle, and the smallest of the tongue muscles. It arises from the ventral surface of the basi-hyal and passes directly forward to the glosso-hyal. The function of this muscle is to depress the tip of the tongue and to elevate the base.

THE MUSCLES OF THE EYE.

It is advisable to leave the dissection of these muscles until after the dissection of the neck. For, in order to see them, a large portion of the skull must be cut away. The muscles of the eye in the pigeon consist of those muscles which perform the movements of the eyelids and ball. They are the

Orbicularis palpebrarum,

Pyramidalis nictitans,

Obliquus superior,

Obliquus inferior,

Rectus superior.

Rectus inferior,

Rectus externus,

Rectus internus.

ORBICULARIS PALPEBRARUM.—This muscle consists of a few fibres which surround the external eyelids. In the upper eyelid the fibres are very indistinct, but on the lower they are distinct, because it is upon this lid that the action of the muscle is principally exerted. The eye is closed by the lower lid being drawn up.

PYRAMIDALIS NICTITANS.—In order to see this muscle it is necessary to take hold of the free edge of the nictitating membrane, or third eyelid, with the forceps and pull it backward over the eye. When the membrane is tense, it will be noticed that the free border is thicker than the rest of it. This thick part is really the tendon of the *Pyramidalis nictitans*. If this tendon is followed up, it will be found to spring from a little muscle which arises from the lower internal side of the eyeball. It soon gives off the tendon just spoken of, which passes through a pulley formed by another muscle, called the *quadratus nictitans*, whose function is to prevent the *pyramidalis* tendon from pressing on the optic nerve in its action. After the tendon passes through this muscular pulley, it passes downward to reach the lower extremity of the third eyelid, to which it is attached along its entire free margin. The action of this muscle is to pull the third eyelid over the eye.

QUADRATUS NICTITANS is a small band of muscle fibres arising from the sclerotic of the upper side of the eye ball. Its fibres pass downward and inward to be inserted into the sheath of the optic nerve. The function of this muscle is to form a pulley for the *Pyramidalis*.

OBLIQUUS SUPERIOR.—The two oblique muscles arise close together, and will be easily recognized by their closely connected origins and their widely separated insertions. The obliquus superior arises from the antero-internal surface of the orbital plate of the frontal bone. Its fibres pass backward and upward to be inserted into the upper side of the eye ball.

OBLIQUUS INFERIOR arises close to the preceding and forms a similarly shaped muscle. The fibres pass backward and downward to be inserted into the sclerotic of the inferior surface of the eye-ball.

THE RECTI MUSCLES.—The four recti muscles will arise from that portion of the interorbital septum which forms the circumference of the optic foramen. The superior rectis arises from the superior border of this margin, the fibres pass forward, upward and outward to be inserted into the superior border of the sclerotic. The rectus inferior arises from the inferior portion of the foramen circumference. Its fibres pass forward, downward and outward to be inserted into the inferior surface of the sclerotic.

The rectus externus arises from the posterior portion of the foramen circumference. Its fibres

pass outward and backward to be inserted into the posterior surface of the sclerotic.

The rectus internus arises from the anterior surface of the foramen circumference, and its fibres pass outward and forward to be inserted into the anterior surface of the sclerotic of the eyeball.



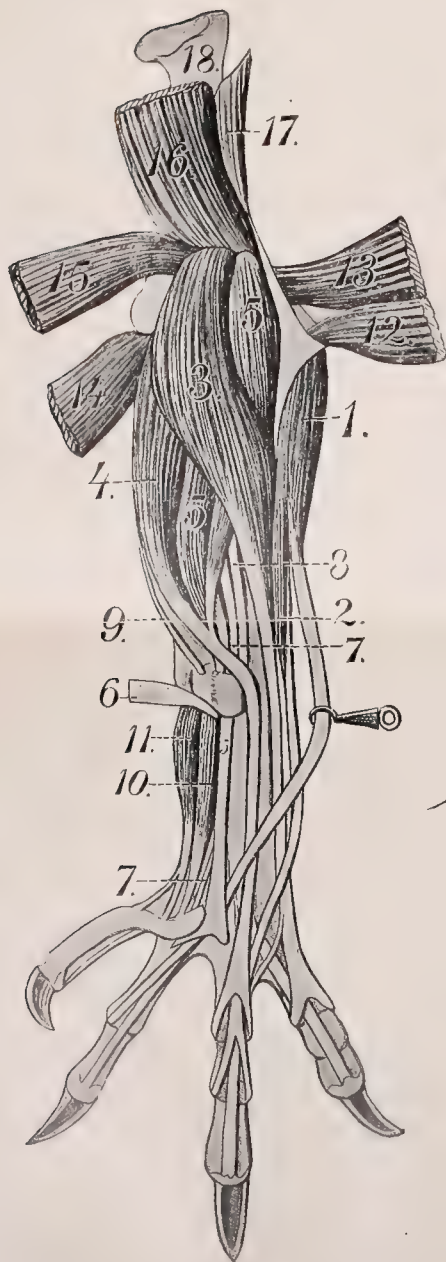


Fig. 4.

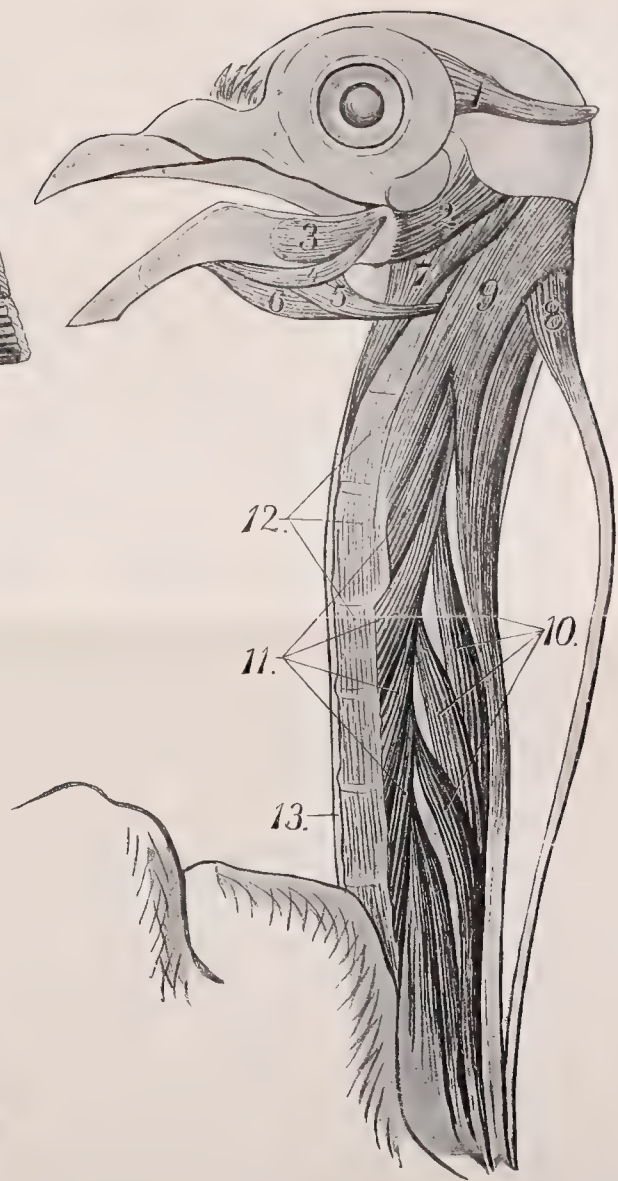
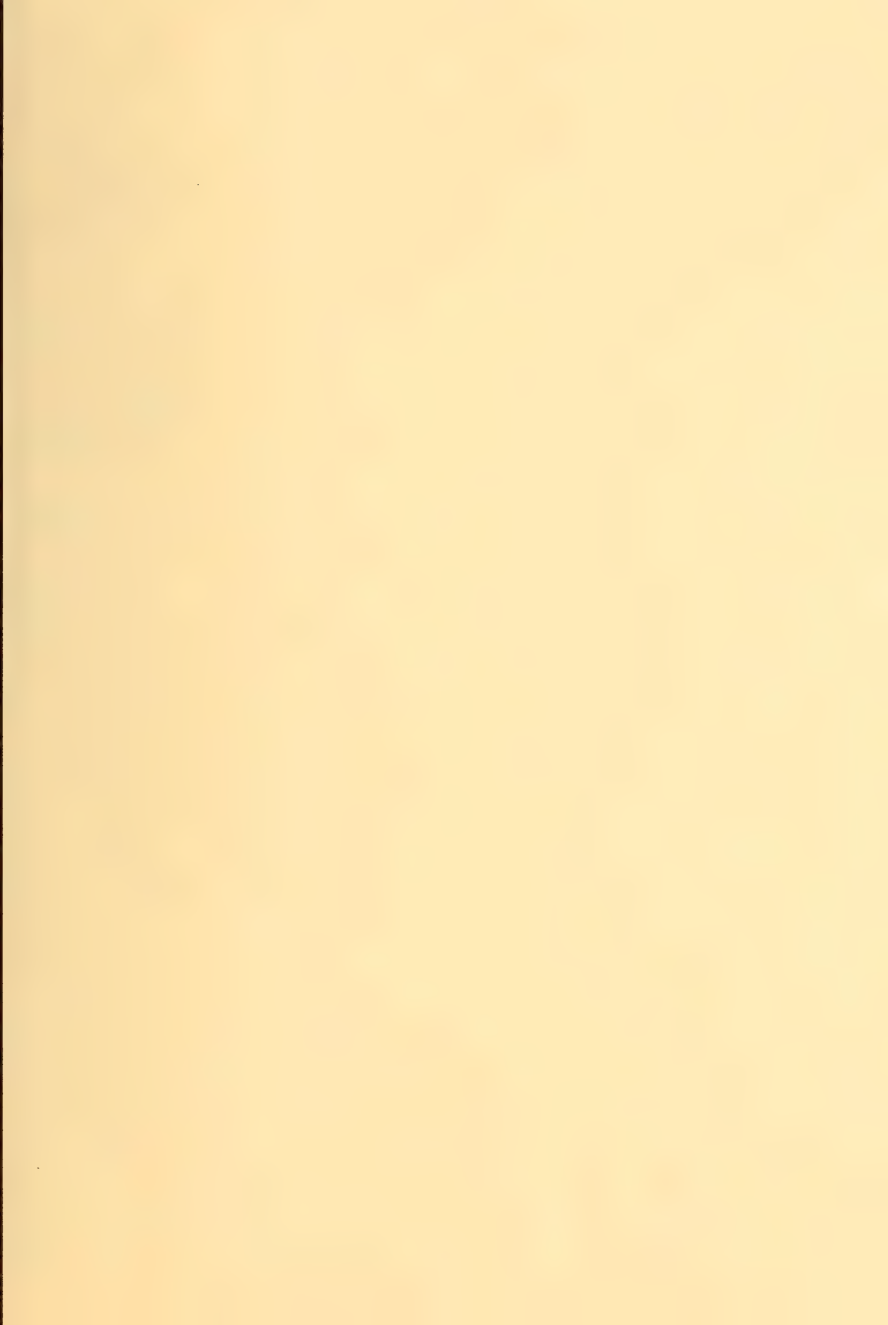


Fig. 1.





INDEX TO PLATE I, FIG. 1.

1. Platisma myoides.
2. Digastric.
3. Masseter.
4. Stylo-hyoides.
5. Genio-hyoid.
6. Cerato-hyal.
7. Rectus capitis lateralis.
8. Biventer cervicis.
9. Complexus.
10. Longus colli posticus.
11. Obliquus colli.
12. Inter transversales.
13. Longus colli anticus.

INDEX TO PLATE I, FIG. 4.

1. Flexor perforatus medius secundus pedis.
2. Flexor perforatus indicis secundus pedis.
3. Flexor perforatus annulis primus pedis.
4. Flexor perforatus medius primus pedis.
5. Flexor perforatus indicis primus pedis.
6. Tendon of the Gastrocnemius.
7. Tendon of the Flexor longus hallucis.
8. Flexor profundus digitorum.
9. Soleus.
10. Flexor hallucis brevis.
11. Extensor hallucis brevis.
12. Biceps femoris.
13. External head of the Gastrocnemius thrown back.
14. Middle head of the Gastrocnemius thrown back.
15. Internal head of the Gastrocnemius thrown back.
16. Adductor longus.
17. Insertion of the Vastus externus.
18. Femur.

THE MUSCLES OF THE NECK.

These consist of a superficial set of muscles which arise from the different cervical vertebræ and insert on the head, and of a deep set of muscles which connect the vertebræ with each other. They are the

Biventer cervicis.

Complexus.

Rectus capitis posticus.

Longus colli posticus.

Obliquus colli.

Rectus capitis lateralis.

Trachelo-mastoideus.

Rectus capitis anticus.

Longus colli anticus.

Inter spinales.

Inter transversales.

BIVENTER CERVICIS arises partly from neighboring muscles and partly by a delicate tendon from the neural spine of the antepenultimate cervical vertebra. Its muscular origin is from the longus colli posticus. Its tendinous origin extends forward on the dorsal side of the neck in the

median line, soon passing into a spindle-shaped belly about one and a half inches long, again becoming tendinous, succeeded by a second belly which inserts into the supra-occipital between the complexus and rectus capitis posticus.

COMPLEXUS arises from the transverse processes of the fourth, fifth and sixth cervical vertebræ. This extensive origin gives the muscle good breadth. It is inserted at the supra-occipital region, its insertion extending to the posterior median line where it blends with its fellow of the opposite side.

RECTUS CAPITIS POSTICUS arises from the whole length of the spine of the axis, extends upward and is inserted below the supra-occipital margin. It is a thick, strong muscle found immediately below the complexus. Its function is to extend the head.

LONGUS COLLI POSTICUS.—This is a long muscle extending the whole length of the back of the neck. Its origin is from the neural spine of the ante-penultimate dorsal vertebra, and by muscular slips from the lamina of the cervical vertebræ as far forward as the seventh. At its most posterior origin it blends with the fibres of the longissimus dorsi. It extends directly forward on the back of

the neck to be inserted into the neural spine of the axis, blending somewhat at this place with the biventer cervicis.

OBLIQUUS COLLI consists of six muscular digitations. The first or posterior digitation arises from the transverse process of the eleventh cervical vertebra and inserts into the spine of the ninth cervical vertebra, and so each digitation arising from a transverse process inserts into the spine of the vertebra next but one in front of it; the anterior four digitations unite with the three digitations of the longus colli posticus.

RECTUS CAPITIS LATERALIS is a triangular muscle situated at the front and side of the neck. It arises from the third, fourth and fifth cervical vertebrae, and passes obliquely upward to be inserted into the basi- and par-occipital regions. This muscle draws the head to the side and flexes it upon the neck.

TRACHELO-MASTOIDEUS.—This muscle is shaped somewhat like the preceding and arises in common with it, partly overlapping it in its course. It is inserted into the basi-temporal bone. Its action is similar to that of the rectus lateralis.

RECTUS CAPITIS ANTICUS.—This is triangular and is situated in the front (ventral surface) of the

neck. It arises from the ventral surface of the transverse processes and from the centræ of the second, third and fourth cervical vertebræ. It blends somewhat with the complexus and is inserted into the basi-temporal.

LONGUS COLLI ANTICUS is a long muscle extending the whole length of the ventral side of the neck. It arises from the centræ and transverse processes of the posterior cervical vertebra, and inserts on the centrum of the atlas. The deep muscles of the neck are those which bind the different parts and processes of one vertebra to another. The most important of these are :

INTER-SPINALES.—A series of muscles connecting the neural spines. They are best seen in those cervical vertebræ which have high spines.

INTER-TRANSVERSALES is a series somewhat similar to the preceding, but arranged in two sets. One set connects the transverse processes, the other connects the parapophyses. These muscles afford protection to the vertebral artery.

MUSCLES OF THE PECTORAL EXTREMITY.

In this group will be found certain cutaneous muscles lying in the alar membrane, the muscles forming the fleshy portion of the breast and the muscles of the arm. The group consists of the

Tensor Patagii longus,
Tensor Patagii accessorius,
Tensor Patagii brevis,
Pectoralis major,
Pectoralis secundus,
Pectoralis tertius,
Pectoralis quartus,
Biceps,
Triceps,
Brachialis anticus.

In taking off the skin of the breast and arm, the student should be careful not to remove the patagii muscles situated in the wing or alar membrane.

TENSOR PATAGII LONGUS.—This is a subcutaneous muscle lying in the alar membrane. Its muscular fibres take their origin from the antero-external region of the pectoralis major muscle ; it

receives fibres from a similar muscle, the tensor patagii brevis, and then gives off a long tendon which passes through the free border of the alar membrane to be inserted into the skin on the preaxial border of the manus.

TENDON PATAGII ACCESSORIUS.—This is also a subcutaneous muscle, which lies in the posterior region of the alar membrane. It arises from the bicipital fascia, and also has fascial connection with the tendon of the tensor patagii longus. The belly of this muscle is quadrilateral, and gives off a long tendon which passes across the alar membrane till it reaches the free border of the membrane, where it passes parallel to the tensor patagii longus to be inserted with it into the skin of the preaxial border of the manus.

TENSOR PATAGII BREVIS.—This muscle is situated on the dorsal aspect of the shoulder, consisting of a broad sheet of muscle fibres. It arises from the dorsal ends of the furcula and coracoid. It then passes backward, running alongside of, and partly covering, the triceps. It then has some connection with the tensor patagii longus, at which point it gives off a broad tendon, which is inserted into the fascia of the extensor carpi radialis longior at the elbow joint.

PECTORALIS MAJOR.—This is the muscle which forms the greater portion of the fleshy breast of the pigeon. It arises from the ventral part of the whole length of the keel of the sternum, from the body of the sternum and from the clavicle. It is closely connected with the pectoralis tertius, which it overlies. It is inserted by muscular fibres into the ventral aspect of the greater tuberosity of the humerus. The function of this muscle is to depress the wing.

PECTORALIS SECUNDUS (SUB-CLAVIUS).—This is the bipinnate muscle, lying immediately beneath the muscle last described. Its fibres arise from the keel of the sternum and from the body of the sternum internal to the origin of the preceding muscle. Its fibres converge anteriorly, and form a round tendon which passes through the foramen triossum to be inserted on the outer side of the humerus, just below the insertion of the pectoralis major. The function of this muscle is to elevate the limb.

PECTORALIS TERTIUS arises from the corpus sterni near the costal border, and forms a strong tendon which is inserted into the lesser tuberosity of the humerus. Its fibres are closely connected with those of the pectoralis major, except at its insertion.

PECTORALIS QUARTUS.—This muscle is the smallest of the pectorals, and is situated at the front of the breast. It arises by two heads, one from the dorsal extremity of the clavicle, the other from the dorsal surface of the manubrium of the sternum. The two heads unite to form a common insertion into the lesser tuberosity of the humerus, blending with the subscapularis at this point.

BICEPS.—This is a long fusiform muscle occupying the antero-internal aspect of the brachium. It arises by two heads, one from the outer aspect of the head of the coracoid, just beyond the glenoid cavity. The other head arises from the ulnar tuberosity of the humerus. A common belly is formed whose tendon is inserted into the ulna, just in front and below the articular cavity. The function of this muscle is to flex the ante-brachium.

TRICEPS.—This muscle is a large one situated on the inner and hinder surfaces of the arm. It consists of two distinct bellies and three heads. The scapula or long head arises by a tendon from the rounded tubercle on the outer posterior margin of the glenoid cavity of the scapula. It forms a somewhat thick flat belly, which winds around the shoulder joint beneath the scapular portion of the deltoid, runs down the postero-lateral aspect of the

humerus, having fascial connection with the external triceps. It then forms a flat tendon just above the elbow, where it is inserted into the radial side of the olecranon process of the ulna. The internal head arises on the inner margin of the pneumatic fossa, and unites below the fossa with the third or external head. This head of the muscle arises on the outer margin of the pneumatic fossa, forming a well-marked bifurcation to the common belly thus formed, the fibres of which make attachment to the posterior surface of the humerus, and from thence the muscle passes over the elbow joint to be inserted into the olecranon process of the ulna. The function of this muscle is to extend the ante-brachium.

BRACHIALIS ANTICUS is a small muscle arising from the anterior and inner side of the distal extremity of the humerus and inserting on the proximal end of the ulna immediately below the greater sigmoid cavity. It has the function of flexing the ante-brachium.

MUSCLES OF THE TRUNK AND PECTORAL LIMB.

The muscles of this group consist mainly of the muscles which bind the scapula to the body. They are, the

Latissimus Dorsi.

Trapezius.

Rhomboideus.

Levator Scapulæ.

Serratus magnus.

Thoracico Scapularis.

LATISSIMUS DORSI is the most superficial of the muscles of the back in the scapular region. It arises from the spines of the last cervical and the first dorsal vertebræ, and extends as a thin band of muscle superficially over all the muscles of this region. Then it passes between the scapular and humeral parts of the biceps to be inserted into the hinder surface of the shaft of the humerus at about its middle.

TRAPEZIUS.—This muscle is found immediately beneath the preceding. It stretches across from the back to the scapula and helps to bind that bone firmly to the body. It arises from the neural spines of the last cervical and first four dorsal vertebræ, and inserts along the whole length of the vertebral margin of the scapula.

RHOMBOIDEUS is situated immediately beneath the preceding and has nearly the same origin and insertion. It arises from the neural spines of the first four dorsal vertebræ. Its fibres pass obliquely backward to insert along the posterior two-thirds of the vertebral margin of the scapula and also on the internal surface of that bone.

LEVATOR SCAPULA is found immediately beneath the rhomboideus. It arises by muscular fibres from the transverse processes of the first two cervical vertebræ and inserts into the middle of the internal surface of the scapula.

SERRATUS MAGNUS arises by three fleshy digitations from the second, third and fourth dorsal ribs. These digitations unite to form a common band of muscle which inserts on the lower margin of the distal end of the scapula.

THORACICO SCAPULARIS.—This is a muscle seen on the chest wall, anterior to the muscle just de-

scribed. It arises by two fleshy digitations from the last free rib and the first dorsal rib. The two digitations unite to form a common belly which penetrates the subscapularis muscle to be inserted into the inner surface of the scapularis about its proximal fourth.

MUSCLES OF THE SHOULDER-GIRDLE AND ARM.

The shoulder-girdle of the pigeon consists of the scapula, clavicle and coracoid. So that under this head we will consider the muscles that arise from these three bones and insert into the humerus. They are the

Teres major.

Subscapularis.

Teres minor.

Coraco-brachialis.

Deltoid.

In order to see the muscles reaching from the shoulder girdle to the arm, it is necessary to take the entire shoulder-girdle and arm from the body. To do this one must cut the muscles binding the scapula to the body. Then disarticulate the coracoid from its sternal articulation and cut the clavicle near its sternal articulation with a pair of scissors. To expose the articulations of these bones the large pectoral muscle of the breast must be cut away from the sternum. These bones having been freed from the sternum, the shoulder-girdle and arm will come away from the body.

TERES MAJOR.—This is the largest muscle attached to the shoulder-blade, or scapula. It arises entirely from the scapula, taking its origin from both the external and internal surfaces of the posterior two-thirds of its length. It is fusiform in shape and at first sight seems to cover the entire outer surface of the scapula. Its fibres are collected into a short, strong tendon, which passes to be inserted into the lesser tuberosity of the humerus and also into the margin of the pneumatic fossa.

SUBSCAPULARIS.—Still examining the external surface of the scapula and using the teres major as a landmark, the muscle which is seen immediately in front of it is the subscapularis. This muscle arises from both the inner and outer surfaces of the proximal half of the scapula, being partly covered over by the teres major. The fibres wind around beneath the inferior border of the scapula to the internal surface, where the fibres from the internal and external surfaces meet and form a short tendon, which passes to be inserted into the lesser tuberosity of the humerus in common with the teres minor and pectoralis quartus. The belly of the subscapularis is more or less divided by the insertion of the thoracico-scapularis.

TERES MINOR.—Turning the scapula so that the internal surface may be viewed, and using the subscapularis as a guide, the muscle just in front of it is the teres minor. This muscle arises from the internal surface of the anterior tip of the scapula, but mainly from the upper extremity of the clavicle, where it joins the scapula. Its fibres converge to form a very short tendon which is inserted, with the tendons of the subscapularis and pectoralis quartus, into the lesser tuberosity of the humerus.

CORACO-BRACHIALIS.—This muscle is quite a large one in comparison with the muscles just examined. It will be seen on the antero-internal surface of the coracoid bone. It arises from nearly the whole length of the bone and passes directly upward until it meets the tendons of the subscapularis and teres minor, where it gives off a small tendon to be inserted into the lesser tuberosity of the humerus, between the insertions of the teres major and subscapularis.

DELTOID. Turn the scapula over so as to view the external surface. A long muscle will be seen arising from the anterior end of the scapula and passing obliquely downward to the lower end of the humerus. This is one portion of the deltoid muscle, of which there are two parts. This part

arises from the external surface of the anterior end of the scapula and passes down the arm to be inserted into the external surface of the middle third of the humerus. The other portion of the deltoid muscle arises just in front of the preceding, but not from the same bone. It arises from the upper extremity of the coracoid bone, passes over the shoulder joint to be inserted into the greater tuberosity of the humerus.

INDEX TO PLATE II, FIG. 2.

1. Head of the triceps (humeral).
2. Extensor proprius pollicis.
3. Extensor indicis brevis.
4. Pectoralis major.
5. Tensor patagii longus.
6. Tensor patagii brevis.
7. Biceps.
8. Tensor patagii accessorius.
9. Extensor metacarpi radialis longior.
10. Pronator brevis.
11. Pronator longus.
12. Flexor digitorum profundus.
13. Flexor carpi ulnaris brevior.
14. Flexor digitorum sublimus.
15. Flexor carpi ulnaris longior.
16. Interossei.
17. Flexor brevis pollicis.
18. Flexor metacarpi brevis.

MUSCLES OF THE ANTE-BRACHIUM OR FOREARM.

The muscles of the forearm of the pigeon consist of flexors, pronators, extensors, and supinators. The flexors and pronators are situated on the inside of the forearm, while the extensors and supinators are on the outside of the limb. We will first consider the muscles on the inside of the forearm.

In taking off the skin of the inside of the forearm, the dissector will meet with a tendinous band on the ulnar side extending from the internal condyle to the wrist. This is a part of the flexor sublimus muscle, and must not be removed. The muscles, having been separated, will be found to occupy the following positions from above downward: The uppermost muscle is the extensor metacarpi radialis longior, with its two heads. As it is an extensor muscle, we will consider it when dissecting the outside of the forearm.

The muscle next below this is the pronator brevis, and immediately below this is the pronator longus. Below this and partly covered by it will be found the flexor digitorum profundus. Beneath and between

the last two muscles mentioned, the flexor carpi ulnaris brevior is situated. Below the flexor digitorum profundus and partly covering it is seen the tendinous band spoken of above ; this is the flexor sublimus digitorum, and immediately beneath it will be found the flexor carpi ulnaris longior (Fig. 2.)

The muscles then to be studied on the flexor side of the forearm, are the

Extensor metacarpi radialis longior.

Pronator brevis.

Pronator longus.

Flexor digitorum profundus.

Flexor carpi ulnaris brevior.

Flexor digitorum sublimus.

Flexor carpi ulnaris longior.

PRONATOR BREVIS is the uppermost muscle on the flexor side of the forearm. It arises from a small tubercle above the external condyle of the humerus, crosses the forearm and inserts into the preaxial side of the shaft of the radius a short distance above its distal extremity.

PRONATOR LONGUS is larger than the preceding and lies beneath it. It arises from the internal condyle and inserts along the whole length of the radius beneath the insertion of the brevis. Its function is not only to pronate but also to flex the forearm.

FLEXOR PROFUNDUS DIGITORUM arises by a fleshy head on the inner and radial surface of the shaft of the ulna from the insertion of the brachialis anticus to about one-half the length of the bone. Near the middle of the shaft of the ulna it terminates in a tendon running to the ulnar side of the carpus, passes through the fascial sheath to the anterior margin of the index digit and inserts into the base of the distal phalanx.

FLEXOR CARPI ULNARIS BREVIOR is situated immediately beneath the flexor profundus, and arises from the lower half of the shaft of the ulna. The tendon winds around the radial carpal to be inserted into the ancholysed first metacarpal.

FLEXOR DIGITORUM SUBLIMUS arises from the internal condyle of the humerus, runs down to the ulnar side of the forearm and ends in a strong tendon which is inserted into the ulnar carpal. The carnisous portion of this muscle is entirely hidden by a tendinous band which extends from its origin to its insertion, and forms the real attachments of the muscle. A short distance above the wrist it gives off a short tendon which passes through a fibrous loop at the ulnar side of the carpus and is inserted into the proximal phalanx of the index digit.

FLEXOR CARPI ULNARIS LONGIOR is that muscle which is situated along the inner free side of the ulna and forms the fleshy mass along the ulnar border of the ante-brachium. Its tendon of origin is short and originates from the internal condyle of the humerus. Its tendon of insertion is also short, ending on the ulnar carpal.

EXTENSORS AND SUPINATORS.

EXTENSOR MUSCLES OF THE FOREARM.

The muscles on the outside of the forearm when separated are situated in the following order. Beginning at the anterior aspect, we first have the long head of the extensor metacarpi radialis longior, and behind this we have the short head of the same muscle. Immediately behind this the supinator brevis is seen, and behind it is the extensor communis digitorum. Beneath and between the last two muscles mentioned, the extensor ossis metacarpi pollicis makes its appearance. Behind the extensor communis digitorum, the extensor metacarpi radialis brevior is seen. Behind this again is seen the muscular attachment to the ulna of the same muscle. (See Fig. 3.) The muscles then to be studied on the external or extensor side of the forearm are :

- Extensor Metacarpi Radialis longior,
- Supinator brevis,
- Extensor communis Digitorum,
- Extensor Osis Metacarpi Pollicis,
- Extensor Metacarpi radialis brevior,
- Extensor Indicis longus.

EXTENSOR METACARPI RADIALIS LONGIOR is the principal extensor of the hand upon the forearm. It arises by two strong tendinous heads, one above the other ; the upper from a tubercle above the external condyle of the humerus, the lower from the tubercle of the condyle. The two heads unite to form a common tendon which passes in a well-marked groove on the distal end of the radius to be inserted into the anchylosed first metacarpal. This muscle raises the hand, and draws it forward toward the radial margin of the forearm and retains it in the same plane.

SUPINATOR BREVIS is beneath the preceding. It arises from the external condyle in common with the lower head of the extensor metacarpi radialis longior. It is inserted on the outer side of the shaft of the radius for nearly its entire length.

EXTENSOR COMMUNIS DIGITARUM is below the extensor metacarpi radialis longior, arising from the external condyle of the humerus. Its belly is blended with the supinator brevis for a short distance from their origin, and terminates in a short tendon which at the wrist passes through a groove in common with the tendon of the extensor metacarpi radialis brevior, thence into a well-marked groove along the anterior aspect of the second

metacarpal nearly to the end of the latter, where it lies beneath the tendons of the other muscles, and turns to be inserted on the anterior border at the base of the proximal phalanx of the second digit.

EXTENSOR OSSIS METACARPI POLLICIS is situated deeply in the forearm, its origin beginning just below the sigmoid cavity of the ulna, from the upper portion of the radius and from the interosseus membrane. The muscular fibres terminate in a very delicate tendon which passes to the wrist alongside of the extensor metacarpi radialis longior to be inserted in the first metacarpal.

EXTENSOR METACARPI RADIALIS BREVIOR is a large muscle on the outer aspect of the forearm, arising from the external condyle of the humerus. It has two insertions ; the first is by muscular fibres into the upper half of the shaft of the ulna on its radial side ; the second by a strong tendon which passes to the outer side of the distal end of the ulna, in common with the tendon of the extensor communis digitorum, to be inserted into the middle of the posterior edge of the second metacarpal.

EXTENSOR INDICIS LONGUS arises from nearly the whole length of the shaft of the ulnar side of the radius. The small belly soon terminates in a

long and strong tendon, which passes over the groove at the distal end of the ulna in company with the extensor communis digitorum. It then continues along the superior border of the index metacarpal, over the proximal phalanx of the same, until it reaches the distal phalanx of the index digit, to the proximal extremity of which it inserts, by dividing, into two places.

THE INTRINSIC MUSCLES OF THE HAND.

The muscles of the hand are distributed upon its several aspects as described below, and are the

Extensor proprius Pollicis.

Extensor brevis Pollicis.

Flexor brevis Pollicis.

Flexor Metacarpi brevis.

Extensor Indicis brevis.

Flexor minimi Digiti.

Interosseus dorsalis.

Interosseus Palmaris.

EXTENSOR PROPRIUS POLLICIS is a small muscle which arises from the tendon of the extensor metacarpi radialis longior. It gives off a stout tendon which is inserted into the inner side of the pollex phalanx.

EXTENSOR BREVIS POLLICIS is an extremely small muscle on the outside of the hand, having the same function as the extensor proprius pollicis, but situated on the opposite side of the hand from it. This small muscle arises from the first metacarpal bone, and gives off a delicate tendon which is inserted into the base of the phalanx

opposite the insertion of the extensor proprius pollicis.

FLEXOR BREVIS POLLICIS arises from the proximal end of the second metacarpal. It has no tendon, but the fibres pass to insert into the whole length of the pollex phalanx.

FLEXOR METACARPI BREVIS arises by a tendon from the lower extremity of the ulna. A short distance from its tendinous origin it forms a large belly, which inserts by muscular fibres into the third metacarpal for two-thirds its length. It flexes the hand upon the forearm.

EXTENSOR INDICIS BREVIS arises by muscular fibres from the entire length of the upper and inner side of the second metacarpal. It terminates in a small tendon which inserts into the proximal phalanx of the index digit.

FLEXOR MINIMI DIGITI is a very small muscle which arises from the lower third of the outer border of the first metacarpal. It inserts by muscular fibres into the proximal end of the medius phalanx, which is the smallest finger of the bird's hand.

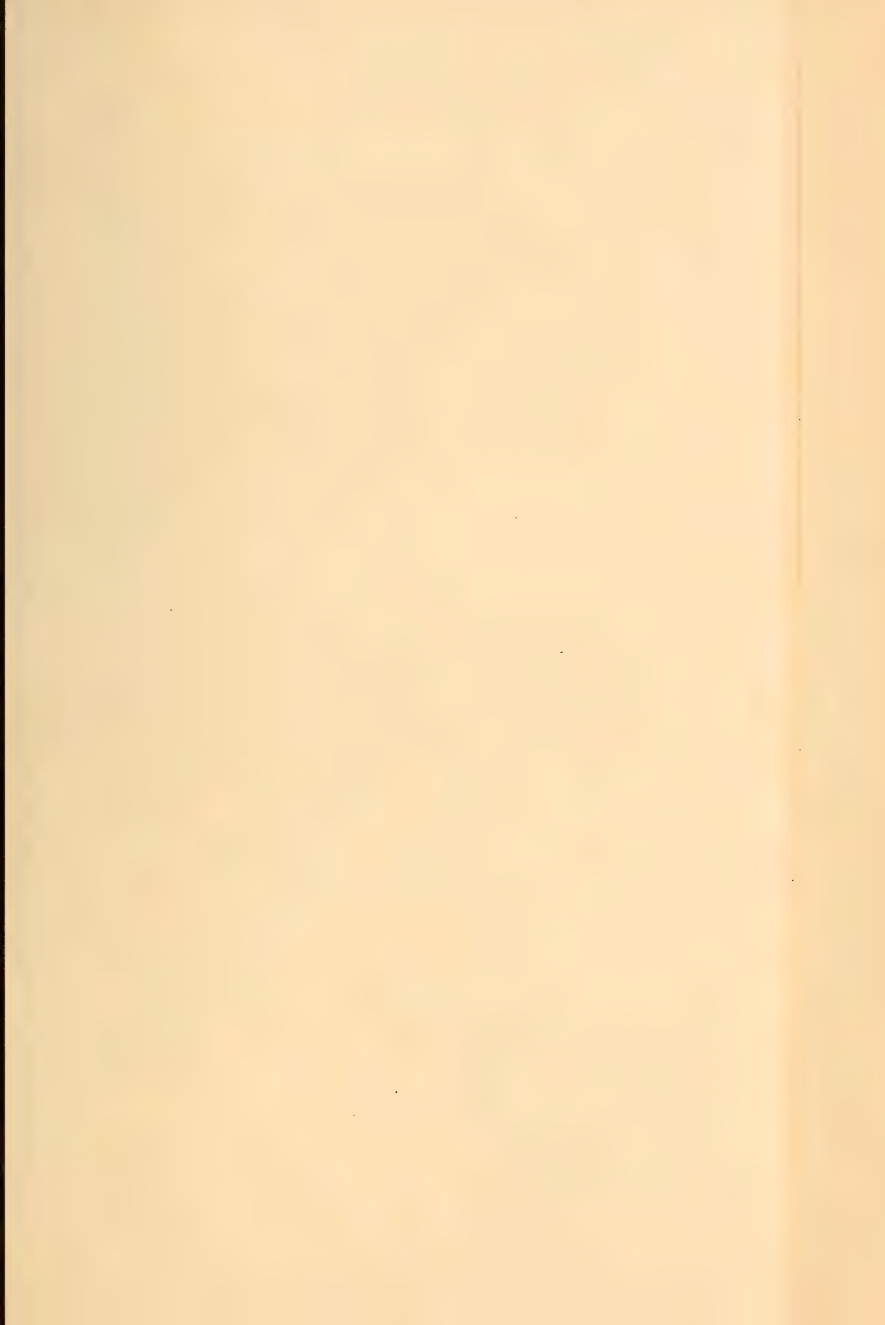
The two following muscles receive their name from their peculiar situations between the second and third metacarpals :

INTEROSSEUS DORSALIS.—This is the most external of the two, and arises from the margins of the shafts of both these bones, the fibres converging to form a delicate tendon which passes to be inserted into the base of the distal phalanx of the index. Its function is to extend this finger.

INTEROSSEUS PALMARIS.—This muscle is situated beneath the muscle last described. Its fibres also arise from the margins of the second and third metacarpal bones, and its origin extends further down than the dorsal interosseus. It ends in a delicate tendon which passes to insert into the distal end of the distal phalanx of the index digit. The function of this muscle is to flex the digit.

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| 2. Deltoid (scapular part of) | 2. Sartorius. |
| 3. Triceps (scapular head) | 3. Crureus. |
| 4. Triceps (humeral head) | 4. Crureus. |
| 5. Extensor metacarpi radialis longior. | 5. Fibres representing tensor vagina femoris. |
| 6. Lower origin of No. 5. | 6. Semi-membranosus. |
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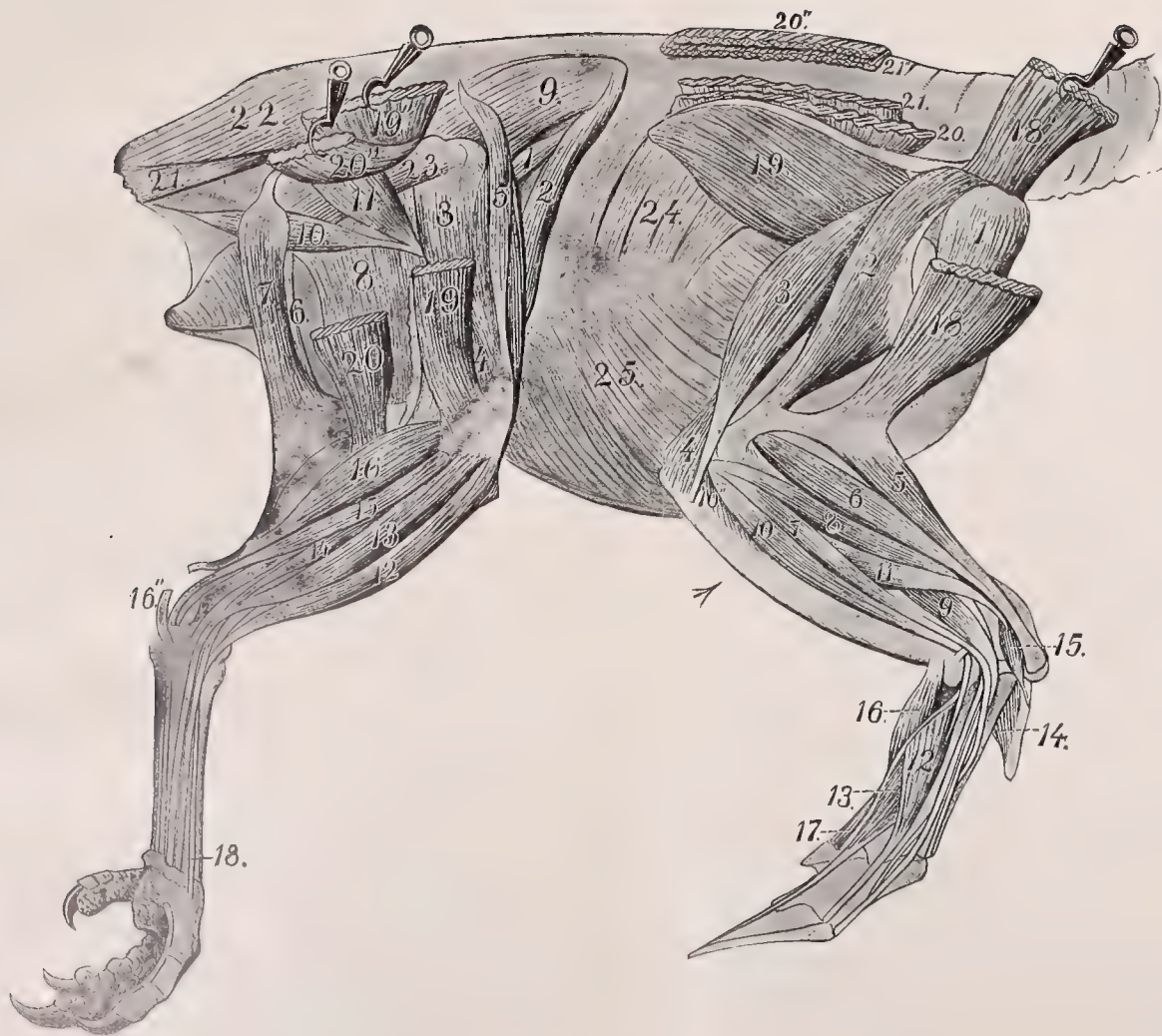


PLATE III.—Fig 3.



THE MUSCLES OF THE THORAX AND ABDOMEN.

In this group of muscles will be found those of the spine, ribs and abdomen. As the spine of the pigeon is short and undergoes few movements, there is no need of many muscles. The ribs and abdomen are well supplied with muscles. The group consists of :

Longissimus dorsi.

Sacro-lumbalis.

Scalenus medius.

Levatores costarum.

Inter costales.

External oblique.

Internal oblique.

Rectus abdominis.

Transversalis abdominis.

LONGISSIMUS DORSI arises from the postero-internal surface of the ilium and from the neural lamina and spines of the dorsal vertebræ. It passes forward as far as the eleventh cervical vertebra. It is bounded externally by a small band of fibres which represent the sacro-lumbalis.

SACRO-LUMBALIS.—This muscle is only slightly developed in the pigeon, and, as in the higher vertebrates, is inseparably connected with the *longissimus dorsi*. It arises from the anterior margin of the ilium and passes as far forward as the first dorsal rib, having attachments to all the dorsal ribs as it passes over their angles.

SCALENUS MEDIUS arises by two muscular digitations from the transverse processes of the eleventh and twelfth cervical vertebræ. The two digitations join to form a common tendon which is inserted into the anterior margin of the free rib.

LEVATORES COSTARUM compose a number of muscular slips found in a series directly behind the *scalenus medius*. The first one arises from the transverse process of the twelfth cervical vertebra, and passes downward and backward to be inserted into the anterior margin of the free rib. The rest of the *levator costarum* have their origins and insertions in succession from the transverse processes of the vertebræ to the corresponding ribs.

INTER COSTALES.—The intercostal muscles are very slightly developed in the pigeon. The set between the first dorsal rib and the free rib are the best developed. The external intercostal here arises from the first dorsal rib as far down as its insertion

into the sternum, the fibres pass obliquely upward and forward, and are inserted into the unciform process of the free rib. The internal intercostals are very slightly formed. They have the same points of attachment, but the fibres pass in the opposite direction.

The abdominal muscles consist of the external and internal oblique, the transversalis abdominalis, and the rectus abdominalis.

THE EXTERNAL OBLIQUE arises by an aponeurosis from the external surface of each of the dorsal ribs at a line corresponding to the borders of the unciform processes. Also by aponeurosis from the inferior margin of the ilium and pubis. The fibres pass obliquely forward and inward to the median line, where in the abdomen the muscle unites with its fellow of the opposite side at the linea alba. The thoracic portion of this muscle is inserted into the sides and xiphoid process of the sternum.

THE INTERNAL OBLIQUE is found immediately below the external oblique. It arises from the inferior margin of the ilium. The fibres pass forward in a radiating manner to be inserted into the posterior border of the last dorsal rib.

RECTUS ABDOMINIS arises by aponeurosis from the whole length of the pubis. The aponeurosis con-

tinues some distance along the abdomen, but soon develops into muscular fibres which pass directly to the xiphoid process of the sternum.

TRANSVERSALIS ABDOMINIS arises by aponeurosis from the inferior border of the ilium and pubis. The fibres pass obliquely across the abdomen to the linea alba, where the muscle meets its fellow of the opposite side. Anteriorly it attaches to the posterior margin of the last rib.

MUSCLES OF THE TRUNK AND THIGH.

In this group will be found those muscles which arise from the different parts of the pelvis and insert into the thigh and leg. They consist of the gluteal muscles, three in number: the biceps femoris, the femoro-caudal and accessory femoro-caudal, the obturators and gemellus muscle, the adductors magnus and longus, the extensors femoris and sartorius, the semi-tendinosus and semi-membranosus.

These muscles will be most conveniently dissected in the following order.

Gluteus maximus.	Sartorius.
Gluteus medius.	Extensor femoris.
Gluteus minimus.	Vastus externus.
Biceps femoris.	Vastus internus.
Femoro-caudal.	Semi-tendinosus.
Accessory femoro-caudal.	Semi-membranosus.
Obturator externus.	Adductor longus.
Obturator internus.	Adductor magnus.
Gemellus.	Ambians.

When the skin is taken off the back and thigh, the first exposed is a broad sheet of muscle covering nearly all the muscles mentioned above. It represents the tensor vaginae femoris, and the gluteus maximus of the higher vertebrates; but will be described here simply as the gluteus maximus.

GLUTEUS MAXIMUS takes its origin by a thin fascia from the entire outer surface of the ilium. The muscle continues as a broad sheet of fascia till it reaches the prominence of the hip, where it begins to develop muscle fibres which are extensive at the posterior portion of the muscle, but thin at the anterior portion. The width of the muscle in the thigh extends as far forward as the posterior border of the sartorius and as far back as the posterior border of the biceps which it covers. As the fibres pass down towards the knee they converge to form a broad aponeurosis, which is continuous with the aponeurosis of the extensor femoris. This aponeurosis covers the front of the knee and is inserted into the cnemial crest of the tibia.

GLUTEUS MEDIUS.—This muscle is found beneath the fascial origin of the gluteus maximus, which must be cut away to expose it. It arises

from the external concave surface of the ilium in front of the acetabulum. The fibres converge to form a flat muscular tendon which passes to the outer surface of the femur to be inserted into the great trochanter.

GLUTEUS MINIMUS.—This is the smallest of the gluteal muscles and is situated anterior to and below the muscle last described. It arises partly from the outer surface of the anterior portion of the ilium and, by muscular fibres, from the proximal and external portion of the first rib. The fibres pass backward, downward and outward to form a tendon which is inserted into the outer surface of the femur just below the great trochanter.

BICEPS FEMORIS is the large muscle found immediately below the gluteus maximus, and arises from the post-acetabular ridge of the pelvis. Its origin here is a broad one and the fibres extend directly down the leg, converging near the knee to form a round tendon, which passes through a tendinous loop to be inserted into the upper extremity of the fibula. It is also connected by fascia to the outer head of the gastrocnemius.

FEMORO-CAUDAL.—After cutting the biceps and throwing it back, the femoro-caudal is exposed, which lies immediately beneath it. This is a

narrow ribbon-like muscle arising from the posterior portion of the pygostyle. It passes obliquely across the side of the pelvis to insert into the posterior surface of the proximal end of the femur. As it passes over the obturator externus muscle it receives the fibres of the accessory femoro-caudal, which is inserted with it.

ACCESSORY FEMORO-CAUDAL arises from the concavity on the posterior portion of the ilium behind the acetabulum. Its fibres pass forward to blend with those of the femoro-caudal, and to be inserted with it.

OBTURATOR EXTERNUS.—This muscle is found immediately beneath the femoro-caudal. It arises from the greater portion of the large concavity found on the external surface of the pelvis, and from the border of the ischiatic foramen. The fibres converge to form a broad flat tendon, which is inserted into the femur just below the great trochanter.

OBTURATOR INTERNUS.—Only the tendon of this muscle can be seen on the outside of the pelvis. It arises from the ventral surface of the pelvis, from the margins of the ischiatic foramen and from the ischium itself. The fibres converge to form a strong tendon, which passes through the

obturator foramen to be inserted with the gemellus muscle into the trochanter of the femur.

GEMELLUS.—This muscle will be seen lying alongside of the tendon of the obturator internus. It is a very small one, and takes its origin from a small fossa between the acetabulum and the obturator foramen on the outside of the pelvis. Its fibres blend with the tendon of the obturator internus, and are inserted with it into the trochanter of the femur.

SARTORIUS.—This is the most anterior of the muscles reaching from the trunk to the leg. It is a strong muscle, possessing the same width throughout its entire length. It arises from the anterior external surface of the ilium and from the dorsal surface of the proximal end of the last rib. It passes directly down the front of the thigh till it reaches the knee-joint, where it terminates in fascia which pass the knee-joint and insert into the inner cnemial crest of the tibia.

EXTENSOR FEMORIS.—This muscle is composed of two distinct portions. The larger portion corresponds to the rectus femoris of higher vertebrates, and the smaller one to the crureus muscle. The larger portion, or rectus femoris, covers the entire front and part of the external surface of the femur,

and arises from the whole length of that bone as far up as the great trochanter. The smaller portion, or crureus, arises from the upper half of the antero-external surface of the femur. These two muscles fuse with the gluteus maximus, and terminate in a tendinous fascia which spreads out over the front of the knee-joint, envelopes the patella and is inserted into the cnemial crest of the tibia.

VASTUS EXTERNUS arises from the lower two-thirds of the outer surface of the femur. The muscle gets broader as it passes down the bone, and at the lower extremity partly envelops the bone. It also ends in the fascia of the knee in conjunction with the gluteus maximus and rectus femoris.

VASTUS INTERNUS arises from the inner and hinder aspect of the femur, at the lower two-thirds of that bone. It becomes larger as it approaches the knee, where it forms a broad tendon which passes over the joint to insert into the inner side of the head of the tibia.

SEMI-TENDINOSUS lies beneath and posterior to the biceps femoris. It arises from the ilium posterior to the acetabulum and above the ilio-sciatic foramen. It passes down the outside of the thigh to a point just beyond the knee-joint, where it terminates in a delicate fascia which inserts into the

fascia of the gastrocnemeus. This muscle receives accessory fibres which spring from the lower extremity of the femur and pass backward to meet the fascia.

SEMI-MEMBRANOSUS.—This muscle is found immediately beneath the semi-tendinosus. It is much smaller than the above, and arises from the posterior two-thirds of the ischium. The muscle is long and flat, terminating in a flat tendon which is connected with the fascia of the internal head of the gastrocnemeus.

ADDUCTOR LONGUS.—This is a large muscle arising from the lower margin of the ischiatic fossa. It passes obliquely down the back of the thigh and inserts into the posterior aspect of the femur for nearly its whole length.

ADDUCTOR MAGNUS.—This is a much narrower muscle than the preceding, having a similar origin, but situated more posteriorly. It passes down the back of the thigh to be inserted into the *linea aspera* of the femur down as far as the internal condyle.

AMBIENS.—This is a very delicate muscle which rises from the ventral margin of the ilium from a point just in front of the acetabulum. The fibres form a very thin muscle which passes down the inner side of the thigh, parallel to the femur. Just

before it reaches the knee-joint it terminates in a delicate tendon which enters the knee-joint and passes between the fascia of the knee-joint and the patella across to the outside of the knee, where it dips down between the muscles of the upper and outer side of the tibia. The tendon then passes to blend with the tendinous origin of the flexor indicis primis pedis, which we will find inserts into the first phalanx of the index toe. So that in the two muscles mentioned we have formed a system which extends the whole length of the leg. This arrangement is such that when the bird goes to roost at night, the weight of the body draws the muscle tight, and thus flexes the toe so as to take a tight grip upon whatever the bird may be resting.

THE MUSCLES OF THE FRONT OF THE LEG.

The muscles occupying the front of the leg are of two kinds. Those which extend the toes and which either extend or flex the tarso-metatarsus on the leg. In the first set there are two muscles, the flexor longus digitorum and the flexor brevis hallucis. In the second set there are also two muscles, the tibialis anticus and the peroneus longus.

Tibialis anticus.

Extensor longus digitorum.

Peroneus longus.

Extensor hallucis brevis.

TIBIALIS ANTICUS is the large muscle occupying the front of the leg. It arises from the front surface of the upper third of the tibia and forms a large fusiform muscle which terminates in a tendon at the lower third of the leg. This tendon passes beneath the oblique ankle ligament to be inserted into the front surface of the upper extremity of the tarso-metatarsus.

EXTENSOR LONGUS DIGITORUM is a delicate spindle-shaped muscle found immediately beneath the tibialis anticus. It arises from the anterior surface of the upper third of the tibia; and soon forms a long delicate tendon which passes down the front of the tibia until it reaches the ankle-joint, where it passes beneath the bony bridge on the anterior surface of the lower extremity of the femur between the condyles. Then the tendon passes down the front of the tarso-metatarsus to the bases of the digits, where it divides into three tendons, which go to the proximal ends of the distal phalanges of the three outer digits. The main tendon receives a few accessory fibres arising from the front of the tarso-metatarsus.

PERONEOUS LONGUS arises from the upper two-thirds of the outer side of the tibia and from the whole length of the fibula. At the lower third of the leg it terminates in a strong tendon which, when it reaches the external ankle, bifurcates, sending a short tendon to the outer side of the tibial cartilage and another down the side of the tarso-metatarsus to join the tendon of the flexor medii primus pedis.

EXTENSOR HALLUCIS BREVIS arises from the antero-internal surface of the tarso-metatarsus.

At the lower third of the bone it terminates in a delicate tendon which soon divides into two, the long one passing along the dorsal surface of the hallux phalanges to be inserted into the proximal end of the distal phalanx. The short tendon is inserted into the dorsal surface of the proximal phalanx.

THE MUSCLES OF THE BACK OF THE LEG.

The muscles of the back of the leg are mainly flexor muscles. In the pigeon we have two flexor tendons going to the hallux and ring toes, and three to the index and middle toes. As in mammals, the superficial tendons are the shortest and divide at their insertion to let the deeper tendons pass through to their point of insertion. The three outer toes receive their deepest tendon from the flexor profundus digitorum, but the hallux has its own deep flexor, the flexor longius hallucis. Where there are three tendons going to one toe, I have used the name primus for the most superficial, and for the next beneath it secundus (after Shufeldt). The deepest tendon in such a case is always a division of the flexor profundus digitorum, *i. e.*, the most superficial muscle going to the middle toe would then be called the flexor medii primus pedis.

The most superficial muscle on the back of the leg is the gastrocnemeus. The gastrocnemeus, soleus and tibialis posticus are muscles which do

not reach the toes, but have the function of extending the tarso-metatarsus. I describe them in the order in which the dissector will find them.

Gastrocnemeus.

Flexor perforatus medii secundus Pedis.

Flexor perforatus indicis secundus Pedis.

Flexor perforatus annularis primus Pedis.

Flexor perforatus medii primus Pedis.

Flexor perforatus indicis primus Pedis.

Flexor longus Hallucis.

Flexor profundus Digitorum.

Soleus.

Tibialis posticus.

Flexor brevis Hallucis.

GASTROCHNEMEUS arises by three heads, one from the external condyle of the femur, one from the internal condyle, and one from the upper inner summit of the tibia. All three heads eventually form a common tendon which passes over the metatarsal joint and inserts into the hypo-tarsal process of the tarso-metatarsus.

FLEXOR PERFORATUS SECUNDUS MEDII PEDIS arises from the outer side of the head of the tibia and by a tendinous origin from the fibula below ; the fibres terminate in a strong flat tendon which passes through the tibial cartilage, thence along the

back of the tarso-metatarsus to pierce the tendon of the basal phalanx and to be inserted into the second joint of the middle toe.

FLEXOR PERFORATUS INDICIS SECUNDUS PEDIS arises from the external condyle of the femur in common with the external head of the gastrocnemius; its thin tendon passes obliquely across the back of the leg, through the tibial cartilage, down to the back of the tarso-metatarsus. From thence it passes to be inserted into the second phalanx of the index digit, being perforated by the tendon of the flexor profundus.

FLEXOR PERFORATUS ANNULARIS PRIMUS PEDIS arises from the posterior surface of the femur between the condyles, and by fascia from the fibula. It blends with the fibres of the flexor medius primis pedis. The fibres then give off a flat tendon which passes along the back of the leg in common with the flexor medius primis pedis. The tendon then passes through the tibial cartilage, to pass along the back of the tarso-metatarsus. From thence it passes along the underside of the last toe, to be inserted by tendinous slips into each side of the basal phalanx.

FLEXOR PERFORATUS MEDII PRIMUS PEDIS arises from the inner side of the belly of the muscle

last described. It also has another fleshy origin from the belly of the flexor primus indicis pedis. The tendons of these two origins unite to form one common tendon, which passes through the tibial cartilage, then along the posterior surface of the tarso-metatarsus to the ulnar side of the basal joint of the third toe, to which it sends down two tendinous slips to either side of the phalanx.

FLEXOR PERFORATUS INDICIS PRIMUS PEDIS.—This muscle arises by a thin tendon from the hinder surface of the external condyle of the femur, and also from the upper and posterior part of the tibia. The fibres converge to form a long tendon which pierces the tibial cartilage. From thence the tendon takes the course of the other tendons piercing the tibial cartilage, down to the back of the tarso-metatarsus till it reaches the under side of the index toe, where it divides and inserts into the sides of the first phalanx, being perforated by the tendons of the flexor indicis secundus pedis and the flexor profundus digitorum.

FLEXOR LONGUS HALLUCIS is found immediately beneath the flexor indicis primus pedis. It arises from the posterior aspect of the femur between the condyles, and from the external condyle. The tendon passes through the tibial cartilage, and

then passes around the accessory metatarsal bone, to be finally inserted into the proximal end of the ungual phalanx of the hallux. In order to get to the ungual phalanx, it has to pass through the tendon of the flexor brevis hallucis, which is attached to the proximal phalanx.

FLEXOR PROFUNDUS DIGITORUM is the deepest of all the muscles of the back of the leg. It arises on the posterior aspect of the tibia and fibula for nearly their entire length. Near the ankle joint it forms a strong tendon which pierces the tibial cartilage and runs down the hinder surface of the tarso-metatarsus close to the bone. At the lower end of the bone it divides into three tendons, which go to the distal phalanx of the second, third and fourth toes respectively.

SOLEUS lies immediately beneath the internal head of the gastrocnemius. It arises from the posterior surface of the head of the tibia, and terminates in a long, slender tendon which is inserted into the tibial cartilage at its inner proximal end.

TIBIALIS POSTICUS arises from nearly the whole length of the shaft of the fibula, from the posterior surface of the tibia and the interosseous membrane. It ends in a strong tendon which passes on the outer side of the ankle joint, to be inserted into

the proximal end of the tarso-metatarsus on its outer side.

FLEXOR HALLUCIS BREVIS is a small muscle arising by a small belly from the posterior surface of the head and shaft of the tarso-metatarsus. It sends off a delicate tendon which passes around the tuberosity on the proximal end of the proximal phalanx to the ventral side of that bone, where it divides to admit the passage of the tendon of the flexor longus hallucis. The two divisions of the tendon insert on the sides of the proximal phalanx of the hallux.

THE MUSCLES OF THE TAIL.

The muscles of the tail are in two sets. Those which insert on the tail bones and perform the movements of the bony tail. And those which insert on the butts of the tail feathers and control their movements. They consist of :

Levator coccygis.

Levator caudæ.

Lateralis caudæ.

Depressor caudæ.

Depressor coccygis.

LEVATOR COCCYGIS arises from the posterior extremity of the dorsal surface of the ilium. Its fibres pass backward and terminate in a small tendon, which is inserted into the dorsal surface of the pygostyle.

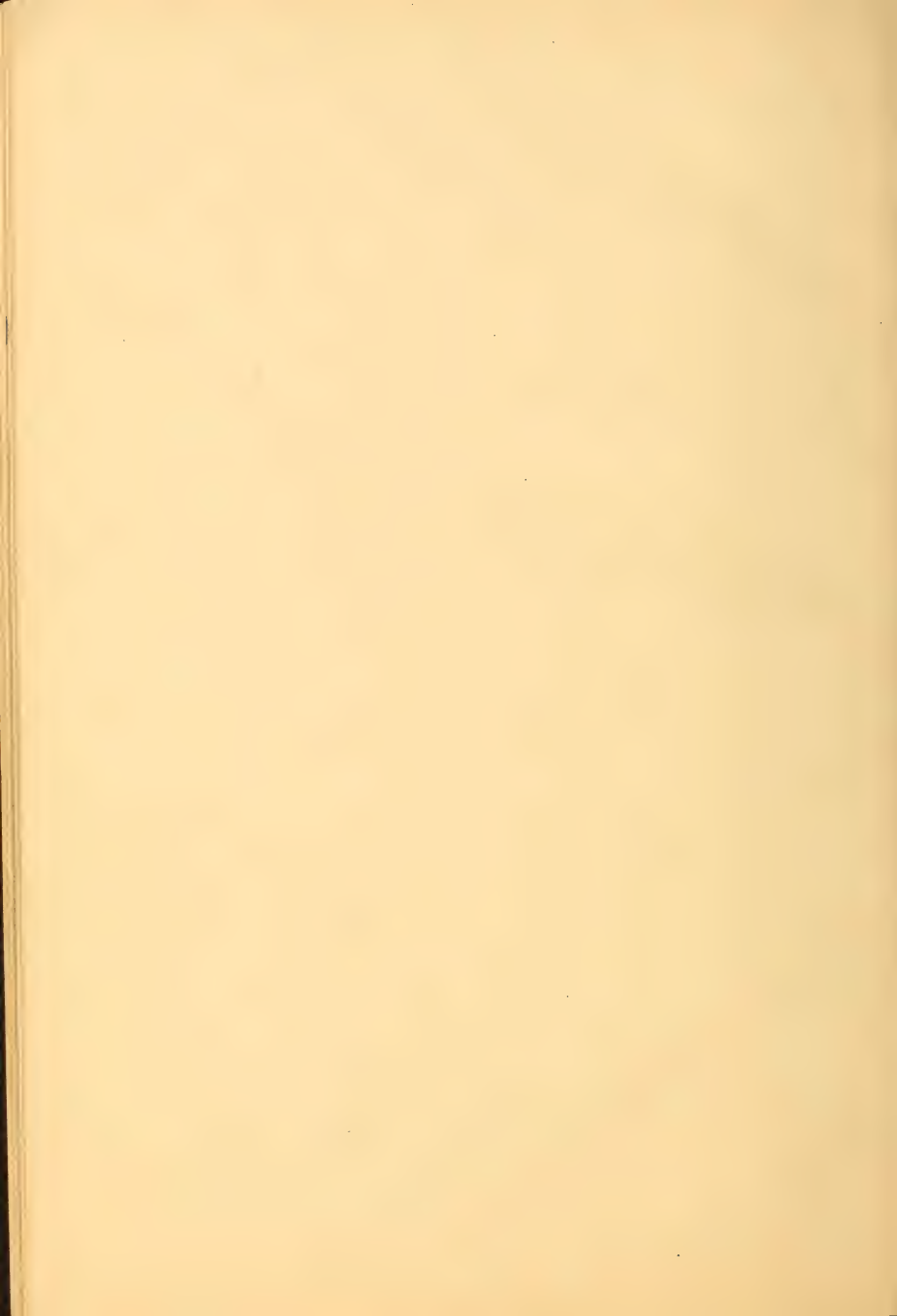
LEVATOR CAUDÆ is a small muscle situated just outside the muscle just described. It arises from the dorsal surface of the last two caudal vertebræ. It is inserted into the ends of the quills of the rectrices feathers.

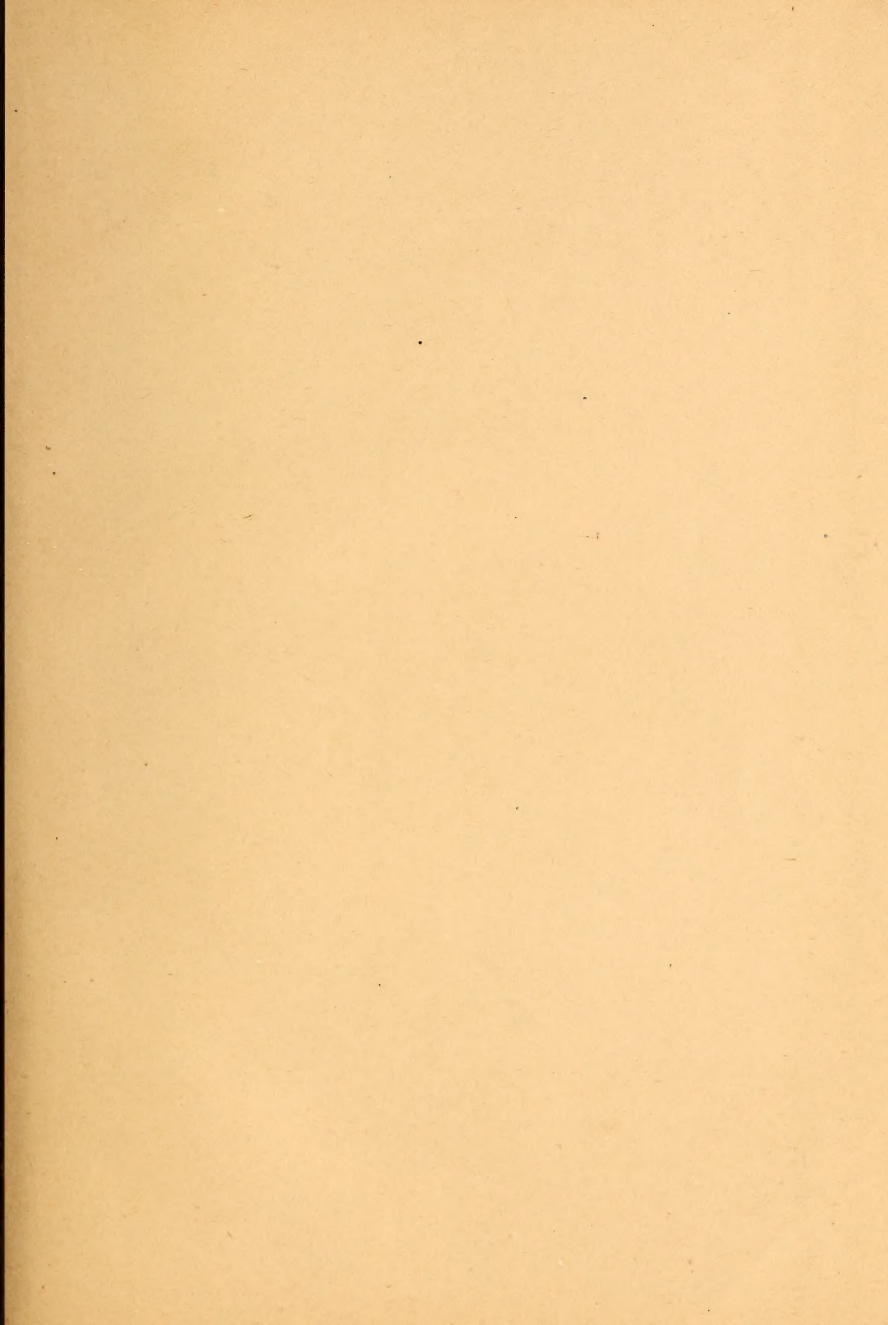
LATERALIS CAUDÆ arises by muscular fibres from the last three caudal vertebræ. It is flat at its origin, but soon develops into a round belly, which inserts into and envelopes the bursa Fabricii on the side of the pygostyle.

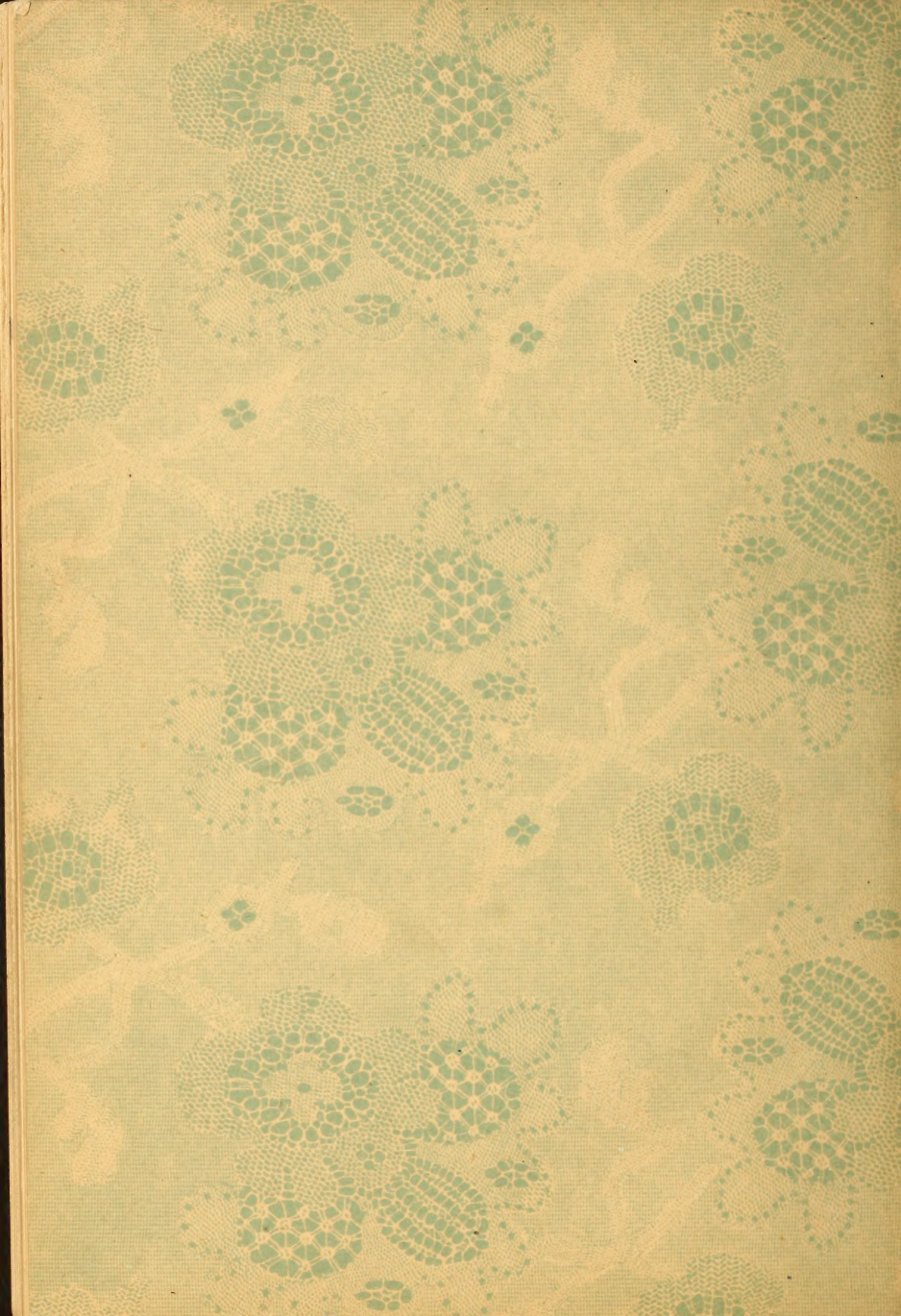
DEPRESSOR CAUDÆ is a conical muscle arising from the whole length of the superior border of the ilium. Its fibres converge as they reach the tail, to insert into the ends of the external rectrices.

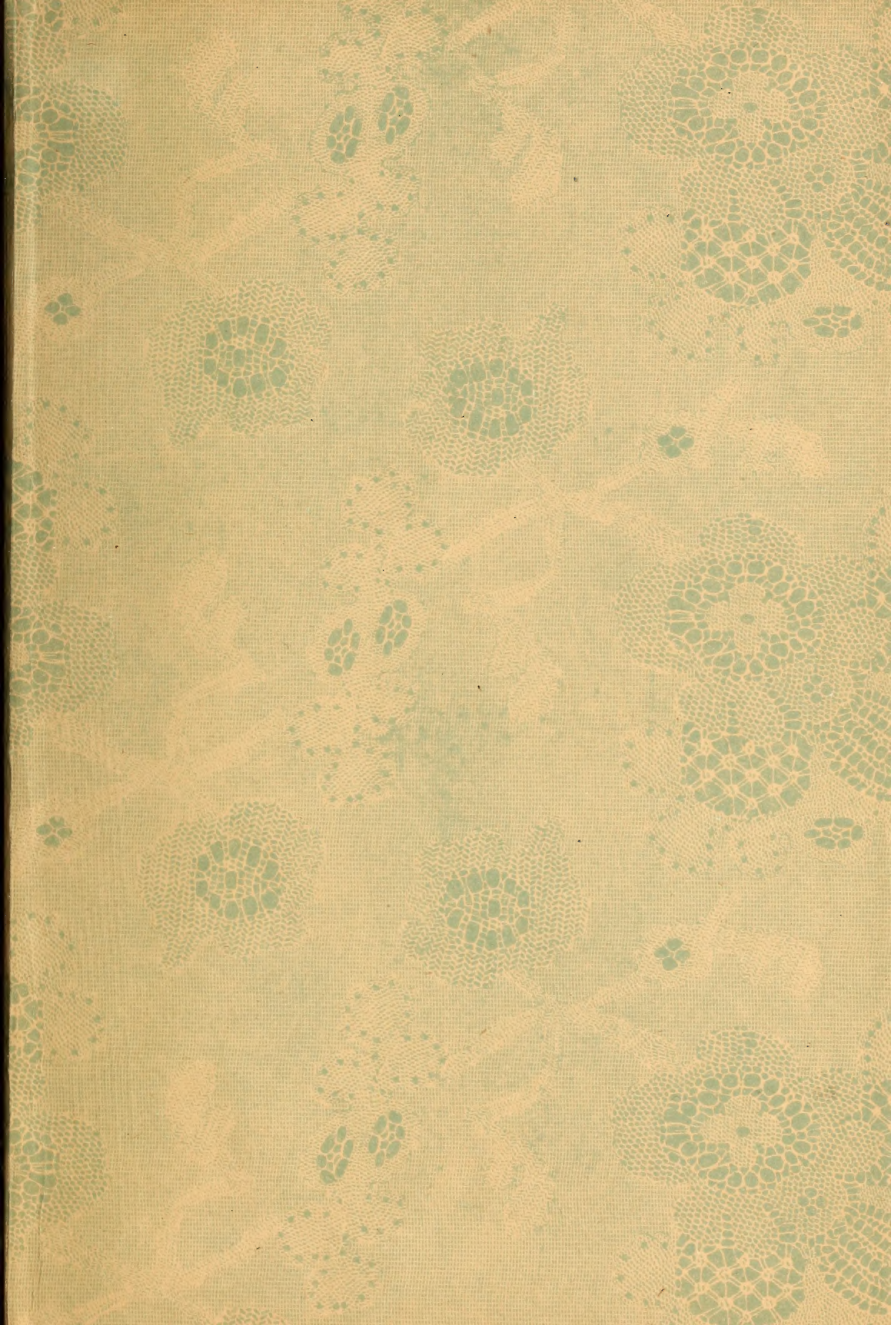
DEPRESSOR COCCYGIS is a fleshy mass of muscle fibres lying beneath the caudal vertebræ. It arises from the ventral surface of the ischium, passes backward to the tip of the tail along the under surface, and finally inserts into the ventral surface of the side of the pygostyle.











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